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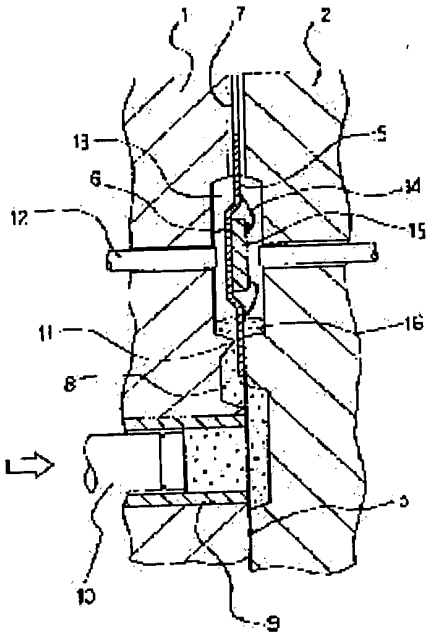
(54) METHOD AND APPARATUS FOR MOLDING SEMICONDUCTOR DEVICE

(57)Abstract:

PURPOSE: To provide a device and method for manufacturing a resin sealed semiconductor device by which the generation of voids is eliminated by uniformly filling the cavity of a metallic mold with a resin so as to improve the yield of the device.

CONSTITUTION: In the title method by which such a semiconductor device that a semiconductor chip 15 is buried in a molded body by holding a lead frame 5 mounted with the chip 15 between a pair of counterposed forces 1 and 2 and filling the cavity 13 formed around the chip 15 with a resin 16, the lead frame 5 is vertically positioned and the resin 16 is injected into the cavity 13 from the bottom side.



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* NOTICES *

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DETAILED DESCRIPTION

[Detailed description]
[0001]
[Field of the Invention] Especially this invention relates to the molding technique of the semiconductor device of a plastic molded type and equipment which fabricate a semiconductor chip by resin mould material, and package-ize it about the molding technique of a semiconductor device, and equipment.
[0002]
[Prior art] The semiconductor device of a plastic molded type carries out the resin seal of the semiconductor chip carried on the leadframe using metal mold, and is formed as a mould Plastic solid. The metal mold used when fabricating the conventional plastic-molded-type semiconductor device is shown in drawing 8 and drawing 9 . drawing 8 -- the upper and lower sides -- both -- the perspective diagram of the status that metal mold was separated -- it is -- drawing 9 -- both -- it is the cross section of the status that carry out pressure-welding combination of the metal mold, and the resin is poured in the leadframe 25 which should be carried out a resin seal through the pin for positioning fixation 24 on female mold 21 using the punch 22 and the female mold 21 as illustrated when carrying out the mould molding of the conventional plastic-molded-type semiconductor device -- level -- carrying -- parting surface 23 comrades of the punch 22 and the female mold 21 -- comparing -- the upper and lower sides -- both -- metal mold -- in between, the leadframe 25 was ****ed and the resin was poured in
[0003] Where parting surface 23 comrades are compared (drawing 9), corresponding to each chip loading section 26 of a leadframe 25, a mold cavity 33 is formed between the punch 22 and the female mold 21. It connects with the lead terminal to which a semiconductor chip 35 is carried in each chip loading section 26, and a leadframe 25 corresponds through a wire 34. A resin 36 is poured in into a mold cavity 33 from an inlet 31 through a pot 29 and the runner 28 by the plunger 30. The slot 27 for air escapes is established in the inlet 31 of a mold cavity 33, and the edge of an opposite side. 32 is an ejector pin.
[0004] If a resin is poured in from an inlet 31 into the mold cavity 33 of the metal mold of the above-mentioned configuration, a resin 36 will run the inside of a mold cavity 33 horizontally along with a leadframe 25, will be filled up with the inside of a mold cavity, and will carry out the resin seal of the semiconductor chip 35.
[0005] The whole semiconductor resin-seal equipment configuration using above-mentioned level conventional arrangement type metal mold is shown in drawing 13 and drawing 14 . In part, drawing 13 is a transillumination perspective diagram and drawing 14 is drawing of longitudinal section. The punch 53 and the female mold 54 are fixed to the upper platen 51 and the lower platen 52 which were prepared in the case 50, respectively. the up-and-down platen 51 and 52 comrades are connected through a guide post 55 -- having -- the lower platen 52 -- a guide post -- meeting -- the vertical orientation -- a slide -- carrying out -- both -- the pressure welding of metal mold 53 and the 54 comrades is carried out, or it dissociates a resin-seal process -- both -- it is filled up with a resin in the mold cavity which carries out the pressure welding of the metal mold, and was formed between both the parting surfaces (pressure-welding separation side) 71 and 72, and the resin seal of the semiconductor chip in a mold cavity is

carried out
[0006] In a case 50, the cleaner 56 in which a both-way move is horizontally possible is formed like arrow head A. this cleaner 56 possessed the air blow section 60 and the brush 59 in the opening 61 at a nose of cam, and separated them at the time of the depuration after a resin-seal process end -- both -- it advances between metal mold 51 and 52, and while dust, such as a remains resin which ground parting surfaces 71 and 72 with the brush 59, and adhered to the parting surface, is rubbed off, it is failed to blow the dust which blew off the compressed air from the air blow section 60 like arrow head B, and adhered to metal mold The dust removed from the parting surface of metal mold is attracted like arrow head C through opening 61, and is discharged outside through a hose 57. The dust which dispersed in the case 50 is attracted in the duct 58 prepared in the case upper part like arrow head D, and is discharged outside.
[0007]
[Object of the Invention] However, in the resin-seal technique of the aforementioned conventional semiconductor device, the problem that occurrence and **** of a void (foam) are poor arises in a resin mould. This is explained in detail from drawing 10 using drawing 12 . Drawing 10 drawing 12 shows in order the status that it is filled up with a resin 36 in the aforementioned conventional level mold cavity 33 of the metal mold of an arrangement configuration. In each drawing, (A) is a plan and (B) is a cross section. As shown in drawing 10 at first, the resin 36 poured in from the inlet 31 prepared in the right end section of a mold cavity 33 advances the inside of a mold cavity 33 toward the left from the right horizontally along with a leadframe 25, and is filled up with the inside of a mold cavity. At this time, with leadframe 25 a top and the bottom, a difference arises in a restoration speed of advance for resistance by the influence of gravity, the wire of a leadframe top, etc., and the direction of the leadframe bottom advances a little quickly.
[0008] It becomes uneven, corresponding to a difference of resistance of the superficial advance status of each part, as it is shown in (A) view, while a speed of advance is greatly overdue for resistance according [a leadframe top] to a wire, a semiconductor chip, etc. in the status that it filled up with the leadframe 25 bottom mostly as it was shown in drawing 11 , when a resin 36 furthermore runs in a mold cavity.
[0009] Thus, since the restoration speed of advance of a resin 36 is uneven, as shown in drawing 12 , that a void (foam) 40 occurs **** or a resin non-filling fraction is formed in the about 27 air escape slot [of the left-hand side edge in a mold cavity 33] bottom in the status that it filled up with the resin to the limit in the mold cavity 33.
[0010] When such a void and a non-filling fraction were formed, since **** was poor, it caused the fall of a functional reliability, and it not only becomes poor in appearance, but had become the cause of a yield fall. Moreover, in connection with large-sized-izing of a semiconductor chip, or thin-shape-izing of a semiconductor device, uniform resin restoration became still difficult, and problems, such as such void occurrence, have posed the still bigger problem.
[0011] Moreover, in the conventional semiconductor resin-seal equipment shown in above-mentioned drawing 13 , the dust removed from the parting surface of the metal mold separated up and down could not be certainly attracted through opening 61, and it could not discharge outside completely through the hose 57, but there was a problem carry out the reattachment on the lower metal mold 54. Moreover, it was completely unremovable through the duct 58 also about the dust which floats in a case 50, and while this suspended particle adheres to the semiconductor chip in front of **** and reduced the quality of a semiconductor device, there was a problem spoil the reliability of a function.
[0012] this invention is made in view of the fault of the above-mentioned conventional technique, and it aims at the manufacture technique of the plastic-molded-type semiconductor device which certainly enables the elimination of the dust of the resin-seal section circumference, and offer of equipment while it is uniformly filled up with a resin in the mold cavity of metal mold, loses occurrence of a void and aims at enhancement in the yield.
[0013]
[The means for solving a technical problem] In order to attain the aforementioned purpose, the

leadframe which carried the semiconductor chip between the mold material (metal mold) in which the couple carried out opposite arrangement is ****ed, mould material (resin) is filled up with this invention in the mold cavity which encloses this semiconductor chip and was formed, in the molding technique of a semiconductor device of laying this semiconductor chip underground in a mould Plastic solid, and ****ing it, the aforementioned leadframe is arranged perpendicularly and mould material is poured in into this mold cavity from the aforementioned mold cavity bottom.

[0014] In a desirable example, while the parting surface of the metal mold of the aforementioned couple is arranged perpendicularly, the aforementioned leadframe is perpendicularly arranged along with this parting surface and a resin inlet is arranged to leadframe ****** of the aforementioned mold cavity soffit section, the air escape opening is arranged to leadframe ****** of the mold cavity upper-limit section, and along with the leadframe in a mold cavity, it is filled up with a resin from the bottom.

[0015] The equipment used by the molding technique of the above-mentioned semiconductor device consists of the metal mold in which the couple which has a parting surface carried out opposite arrangement. The leadframe which carried in between the semiconductor chip which should be carried out a resin seal is ****ed. both -- metal mold -- The mold cavity filled up with a resin is formed in between. both -- the parting surfaces of metal mold -- comparing -- both -- metal mold -- It is the molding equipment of the semiconductor device which ****s the semiconductor chip on the aforementioned leadframe in this mold cavity. The aforementioned parting surface is arranged perpendicularly and it is perpendicularly equipped with the aforementioned leadframe along with this parting surface, and while a resin inlet is arranged at the aforementioned mold cavity soffit section, it constitutes so that the air escape opening may be arranged at this mold cavity upper-limit section.

[0016] moreover, the metal mold of a couple with which the resin-seal equipment of the semiconductor device concerning this invention has arranged the parting surface perpendicularly -- this -- the clean air supply means for supplying clean air from the upper part to metal mold is provided

[0017] The metal mold of the couple which has arranged the parting surface perpendicularly in a desirable example, this -- the case which holds metal mold in seal -- this -- metal mold -- comrades -- a pressure welding and the metal mold for dissociating -- with a drive means The clean air supply means for supplying clean air from the upper part in the aforementioned case is provided. The leadframe which carried in between the semiconductor chip which should be carried out a resin seal is ****ed. the above-mentioned molding equipment -- the same -- both -- metal mold -- The mold cavity filled up with a resin is formed in between. both -- the parting surfaces of metal mold -- comparing -- both -- metal mold -- It is the molding equipment of the semiconductor device which ****s the semiconductor chip on the aforementioned leadframe in this mold cavity. Along with the parting surface arranged at the aforementioned perpendicular, it is perpendicularly equipped with the aforementioned leadframe, and while a resin inlet is arranged at the aforementioned mold cavity soffit section, it constitutes so that the air escape opening may be arranged at this mold cavity upper-limit section.

[0018] the status that the aforementioned parting surface was separated in the still desirable example -- both -- metal mold -- the cleaning means of the parting surface which can advance in between is provided the jet pipe for attracting and exhausting the air in the aforementioned case in a still desirable example -- the above -- it has prepared in the metal mold bottom

[0019]

[Operation] The longitudinal direction of a mold cavity cross section is arranged perpendicularly, and it is perpendicularly equipped with a leadframe in this mold cavity. The resin which is mould material is poured in from the mold cavity bottom, resists gravity, and it fills up with it toward the upper part. It holds in seal in a case, clean air is supplied through a VCF from the upper part, and metal mold is attracted and discharged from a lower part.

[0020]

[Example] The metal mold for carrying out the mould molding of the plastic-molded-type semiconductor device concerning the example of this invention is shown in drawing 1 and drawing 2 . Drawing 1 is the perspective diagram of the status that the metal mold of a right-and-left couple was separated, and drawing 2 is the cross section of the status in early stages of resin injection. The molding

equipment for enforcing this invention technique consists of metal mold 2 the presser-foot side of metal mold 1 and right-hand side the receptacle side on the left-hand side of drawing, and it is equipped with a leadframe 5 through the pilot pin 4 for positioning fixation on the parting surface 3 of metal mold 1 a receptacle side. right and left -- both -- parting surface 3 comrades of metal mold 1 and 2 -- comparing -- both -- metal mold -- a leadframe 5 is ****ed in between This parting surface 3 is arranged perpendicularly. Therefore, the leadframe 5 with which it was equipped on this parting surface 3 is also arranged perpendicularly. A leadframe 5 arranges in parallel and has two or more chip loading sections 6, and is connected to each lead terminal to which a semiconductor chip 15 is carried and a leadframe 5 corresponds through a wire 14 on each chip loading section 6.

[0021] right and left -- both -- where the pressure welding of the parting surface 3 comrades of metal mold 1 and 2 is compared and carried out (drawing 2), a mold cavity 13 is formed in the periphery of each chip loading section 6, and it fills up with the thermosetting resin 16 which is mould material in this mold cavity 13 12 is an ejector pin used as the guide when combining metal mold 1 and 2 and dissociating. As shown in drawing 2 , the longitudinal direction of a cross section is formed perpendicularly, and the resin inlet 11 is formed in leadframe ****** of the center of the soffit section, and the slot 7 for air escapes carries out opening of the mold cavity 13 to leadframe ****** of the center of the upper-limit section. By ****ing a plunger 10 like the arrow head, a resin 16 is injected from a pot 9 and poured in into a mold cavity from the inlet 11 of the soffit section of a mold cavity 13 through a runner 8.

[0022] Drawing 3 , drawing 4 , and drawing 5 are explanatory drawings showing in order the status that the resin is filled up with the inside of a mold cavity 13, respectively. In each drawing, (A) is the cross section of a mold cavity fraction, and (B) is the front view of a leadframe fraction. Drawing 3 shows the phase in early stages of restoration. In order for a resin 16 to resist gravity and to go on toward the upper part from the soffit section inlet 11 of a mold cavity 13, resistance is equalized, and after the upper-limit side has balanced mostly, it goes up compared with the above-mentioned conventional level arrangement configuration (drawing 10).

[0023] It fills up with a resin further in a mold cavity, and drawing 4 shows the status that the semiconductor chip 15 was covered. Thus, also in the status that it filled up with the resin 16 more than the half in the mold cavity 13, it is denied by operation of gravity, unlike the case of the above-mentioned conventional level arrangement configuration (drawing 11), a upper-limit side maintains the almost uniform status, and dispersion in resistance, such as a semiconductor chip to advance of a resin 16 and a wire, goes up the inside of a mold cavity 13.

[0024] Thus, since a resin 16 is filled up with the status with the almost uniform apical surface of the resin advance orientation in a mold cavity 13, air is certainly discharged from the slot for the air escapes of a mold cavity upper limit. Therefore, as shown in drawing 5 , the void 40 or resin non-filling fraction which were formed in [whole] the mold cavity 13 in the conventional level arrangement configuration (drawing 12) after the resin 16 had run are not formed, but the whole inside of a mold cavity 13 is completely filled up with a resin 16.

[0025] right and left of the perpendicular arrangement which drawing 6 and drawing 7 require for this invention of the above-mentioned configuration, respectively -- metal mold -- it is the perspective diagram and cross section of semiconductor device molding equipment which have structure

[0026] the inside of the seal case 50 -- the receptacle side platen 64 and the presser-foot side platen 65 -- a guide post 68 -- minding -- mutual -- a contiguity -- it is prepared possible [an alienation] In this example, the left-hand side presser-foot side platen 65 carries out the slide of the guide-post 68 top by the drive means (not shown), and moves in the receptacle side platen 64 orientation of right-hand side. On each platen 64 and 65, it is equipped with metal mold 67 a metal mold 66 and presser-foot side a receptacle side. Metal mold 66 is equivalent to metal mold 1 the receptacle side shown by above-mentioned drawing 1 , and the same leadframe as drawing 1 is attached on the parting surface 73 of the perpendicular arrangement. Moreover, metal mold 67 is equivalent to metal mold 2 the presser-foot side of drawing 1 , and the parting surface 74 is arranged perpendicularly. The structures of such metal mold 66 and 67 are the structure of the metal mold 1 and 2 explained by aforementioned drawing 1 and

drawing 2 , and a parenchyma top identity.
[0027] The air-supply duct 62 is formed in the case 50 bottom. VCF 63 is formed in the air-supply duct 62 of a position corresponding to the upper part of metal mold 66 and 67. A cleaner 56 is formed in the metal mold 66 and 67 bottom possible [an entry between the parting surface 73 of the metal mold 66 and 67 separated like arrow head E, and 74]. Opening 61 is formed in the upper-limit section of a cleaner 56, and the air nozzle 60 and the brush 59 are formed in this opening 61. 57 is a hose for dust issue. A jet pipe 69 is formed in the metal mold 66 and 67 bottom in a case 50.
[0028] By the resin-seal equipment of the above-mentioned configuration, when carrying out the mould molding of the semiconductor package between metal mold 66 and 67, a resin-seal process is performed as drawing 5 explained from above-mentioned drawing 3 .
[0029] after a resin seal is completed, the semiconductor package which metal mold 67 leaves and by which mould molding was carried out from metal mold 66 takes out -- having -- after that -- both -- the parting surfaces 73 and 74 of metal mold are cleaned While cleaning is performed by making a cleaner 56 advance between the estranged metal mold 66 and 67 and dust, such as a parting surface 73 and a remains resin on 74, is rubbed off with a brush 59, hyperbaric-pressure air is blown off from an air nozzle 60 like arrow head H, and it is failed to blow dust. The dust which failed to be blown is attracted like arrow head J through the opening 61 of a cleaner 56, and is discharged outside through a hose 57.
[0030] At the time of this cleaning, clean air is supplied from the upper part of metal mold like arrow head F through VCF 63 from the air-supply duct 62, and it is discharged outside like arrow head G through the jet pipe 69 prepared in the metal mold bottom. Thereby, without passing downward from a top and carrying out the reattachment on the perpendicular parting surface 73 and 74, the dust which is floating in a case 50 is attracted in a jet pipe 69, and is discharged outside. By always circulating through such clean air, dust adhesion in the semiconductor chip in front of a resin seal is prevented, and a quality resin-seal product is obtained.
[0031]
[Effect of the invention] Since the leadframe which carried the semiconductor chip which should be carried out a resin seal in this invention is arranged perpendicularly and it is filled up with a resin in a mold cavity toward a top from under a perpendicular direction, as explained above, Dispersion in the resistance to the resin restoration in a mold cavity can be suppressed to the minimum extent by operation of gravity. Restoration of a resin is attained in the uniform status, and occurrence of a void, formation of a non-filling fraction, etc. are prevented, therefore a fall of the reliability of the function by poor **** is prevented, and enhancement in the yield is achieved.
[0032] Moreover, by supplying clean air from the upper part of metal mold, and discharging from the bottom, the dust which floats on the outskirts of a parting surface of metal mold is carried in accordance with flowing of the clean air to the bottom from a top, the semiconductor chip in front of a parting surface and a resin seal is kept pure, and a quality semiconductor device is obtained.
[0033] In addition, this invention can be applied to the semiconductor device structure by the resin seal of TAB structure others not only using wirebonding structure but the tape carrier using the leadframe explained in the aforementioned example, and the same operation effect as the case of the aforementioned example is acquired.

[Translation done.]

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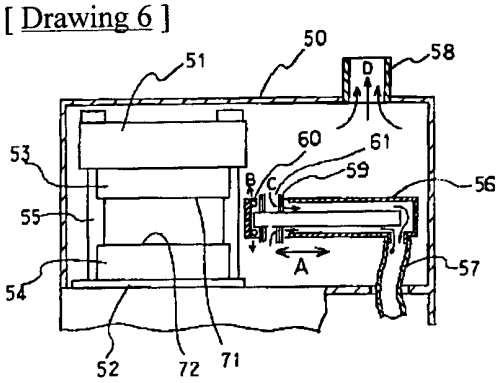
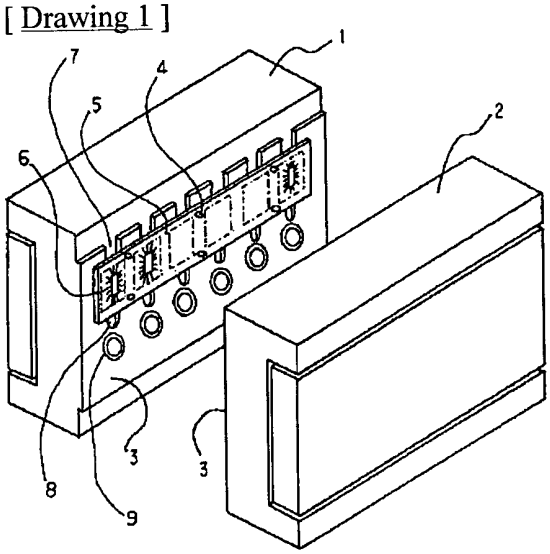
DRAWINGS

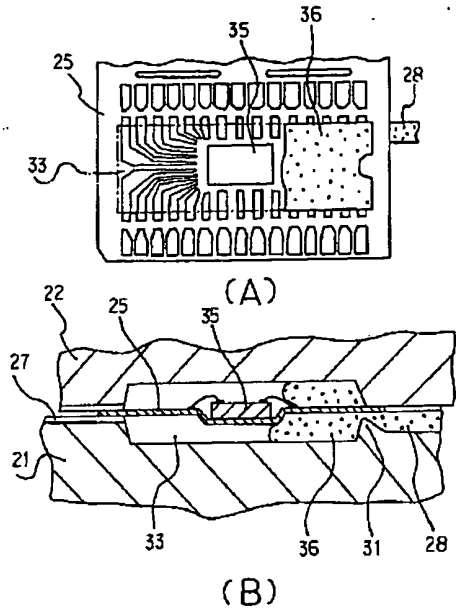
[Drawing 6]



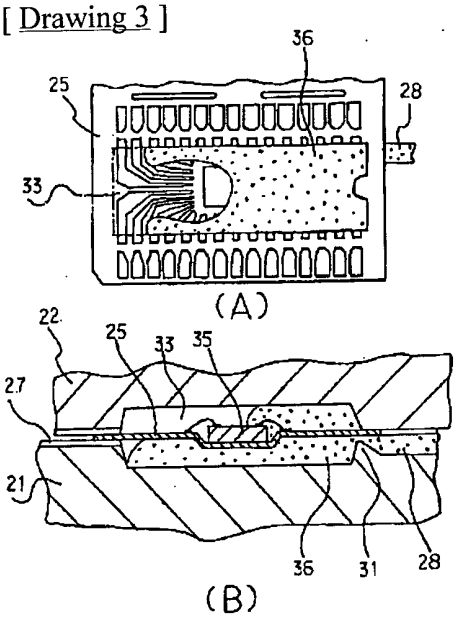
[Drawing 1]



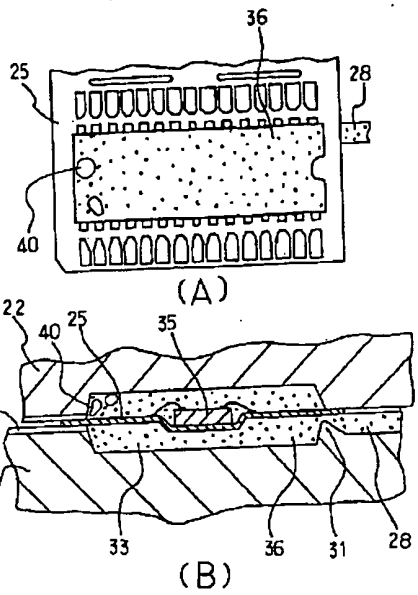
[Drawing 2]



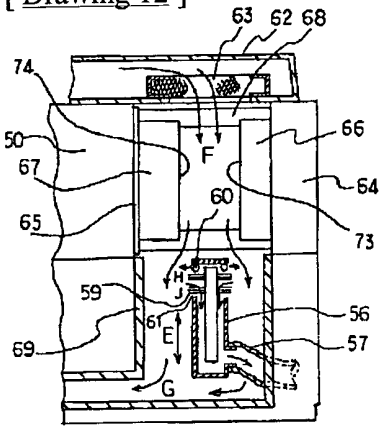
[Drawing 3]



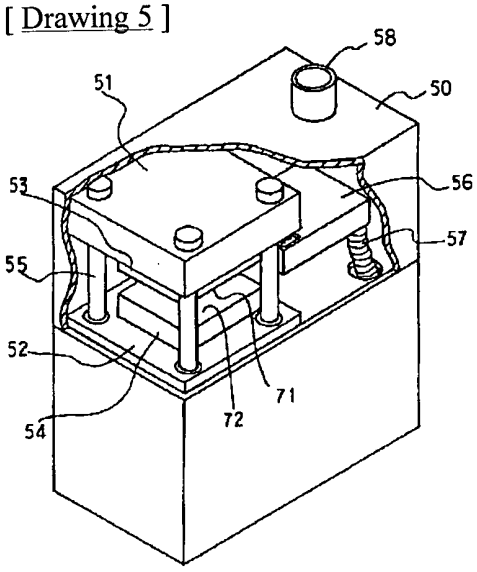
[Drawing 4]



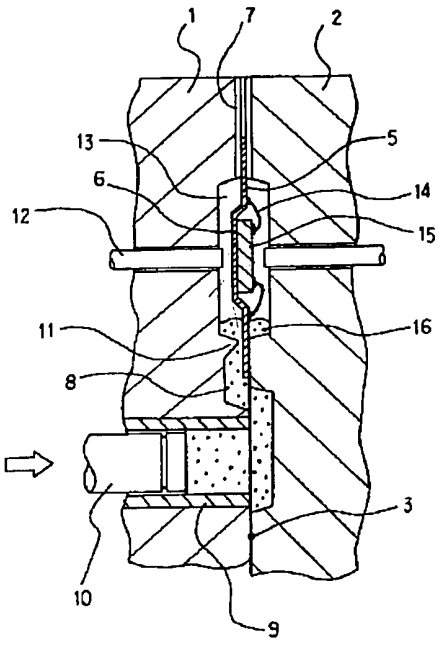
[Drawing 12]



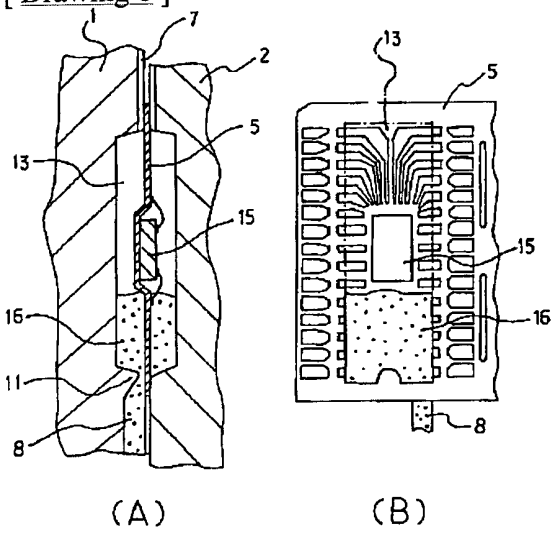
[Drawing 5]



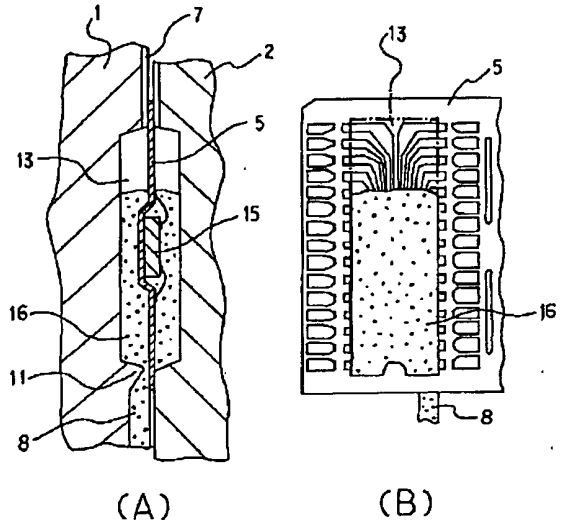
[Drawing 7]



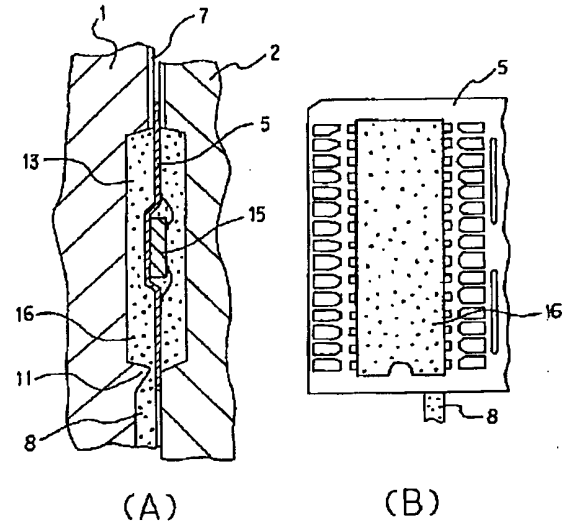
[Drawing 8]



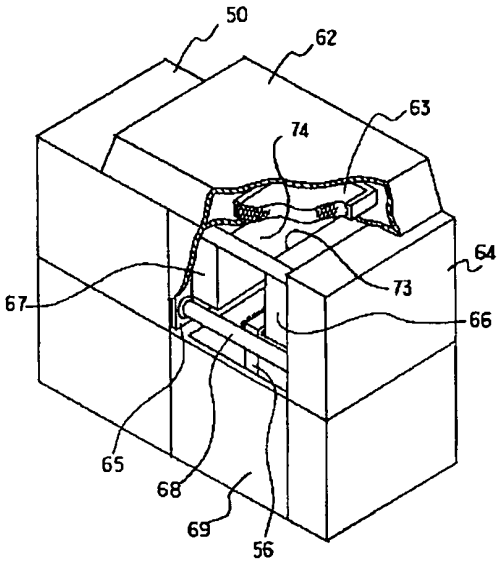
[Drawing 9]



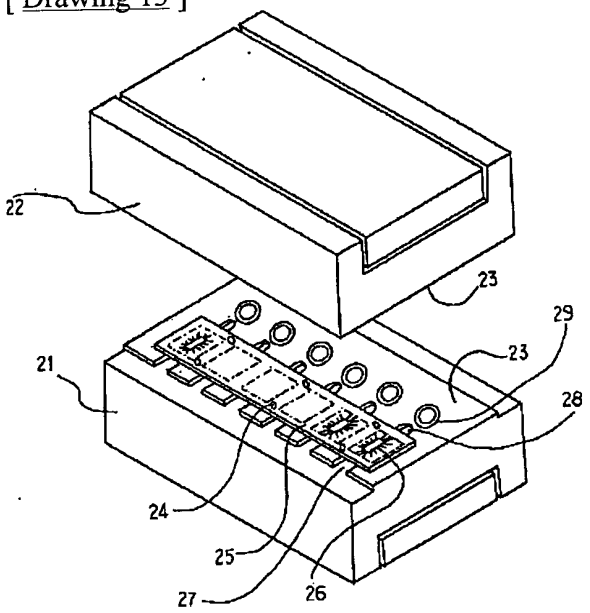
[Drawing 10]



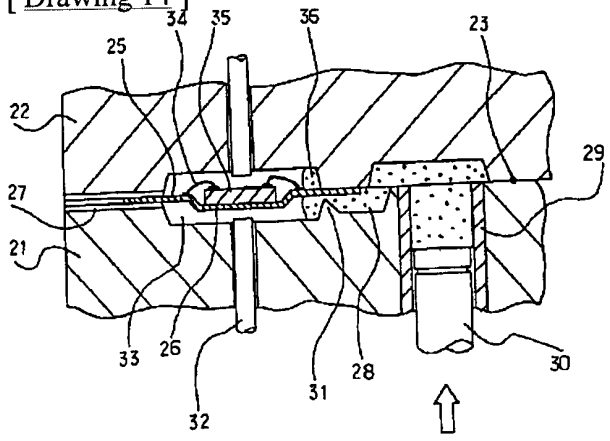
[Drawing 11]



[Drawing 13]



[Drawing 14]



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